Project families: A new concept for student thesis activities

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Project families: A new concept for student thesis activities

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ABSTRACT
The students' activities during their final thesis work have been organised in project families, i.e. a group of individual student project organized in a shared learning environment. The aim is more efficient supervision and support, simultaneously to improved learning. DTU Byg have now tested this concept for 100+ students with experimental activities and found a major improvement in their learning, grades, interaction and behaviour in the laboratories, just as they now provides a strong support for the supervisors' research. The use of resources for the supervision and the support in the laboratories has also been significantly reduced.

Key words: Knowledge and Teaching, Testing.

1. INTRODUCTION

The Technical University of Denmark offers many different engineering educations and the Department of Civil Engineering (DTU Byg) is much involved in teaching courses and supervising student's thesis works. The number of students, doing thesis work at DTU Byg has grown over the years to app. 350 annually and usually with experimental activities included (app. 100 students used the concrete and mortar lab during their thesis work in 2016).

It is the university's policy to strengthen the experimental activities in the educations. This has resulted in four new laboratory buildings for DTU Byg being completed, construction being started or bid being asked for these new buildings in 2016 [1]. The experimental activities will thus not be reduced but increased in the near future according to DTU' strategy, "*DTU will assure and expand the students' access to experimental facilities and activities designed to train engineers*" [2], just as the number of project students are expected to increase.

The growing number of students increases the pressure on our resources, but also challenges our ability to increase the number of new project ideas and cooperation with industry. We are, at the same time, under pressure to maintain or even increase our scientific production and this creates a situation, where we are highly motivated to rethink our organisation of students projects with experimental activities, so the resources are utilized optimally within both teaching and research.

2. THE PROJECT FAMILY CONCEPT

The project family concept is to group individual projects, so they have a common focus. The individual projects can be a mixture of BEng, BSc and MSc projects, where a project has one or two participants (form the same education). The family have a supervisor team with a leading supervisor and the required number of cosupervisors. The supervisor team decides the semesters focus for the project family and ensures that the required info, materials, finances and test facilities will be available.

The students' supervision and instructions in the laboratory will be given to all students in the project family at the same time, but is supplemented with the required individual supervision. These may even include E-learning activities such as the general safety instructions and its electronic exam (used by over 700 in the first year), video recording of instructions (by students, by supervisors or by professionals), so the students can go over the instructions again (if required).

The students will often share the same lab facilities, test setup and even use each other's results (with proper references) and will have a joint start-up meeting and also a midterm presentation of their initial results. This presentation will often be attended by one or several industrial partners.

The students will when possible be given a common room with work places during their project period in order to promote cooperation and peer interaction and to stress the "family" aspect. DTU Byg has over the last years established a number of such project rooms, where all members of one or more project family can work and where lockers are available for students (for storage of PC, personal stuff etc.).

3. RESULTS FROM THE PROJECT FAMILIES

DTU Byg has tested the concept for a period of six years and have started over 100 project students in experimental families in the fields of ZeroWaste Byg (upgrading of waste to a valuable resource), Strengthening with CFRP (Carbon Fibre Reinforced Polymers) to increased loadcarrying capacities and Glass Structures (glass as a load-carrying material). This is only 10 % of the project students at DTU Byg during the period, but we can already identify some effects based on the results with these students.

The grades document (see Figure 1) shows that the students in the project families perform better, as their average grade for the thesis (DK:10,9) is half a grade higher than all the remaining thesis students at DTU Byg in the same period (termed the reference group with a thesis average of DK:10,0), although the students in the project families have the same average grades in their education as the others. The supervisor's experience is also that far fewer thesis lack the vital information required for later use of the results, which have often been a problem (unless the supervisor coached the students). This change has turned the project families into a substantial help for the supervisors research, as a project family may put in e.g. 5000 hours of work during a semester, focused on the specified problem or development.

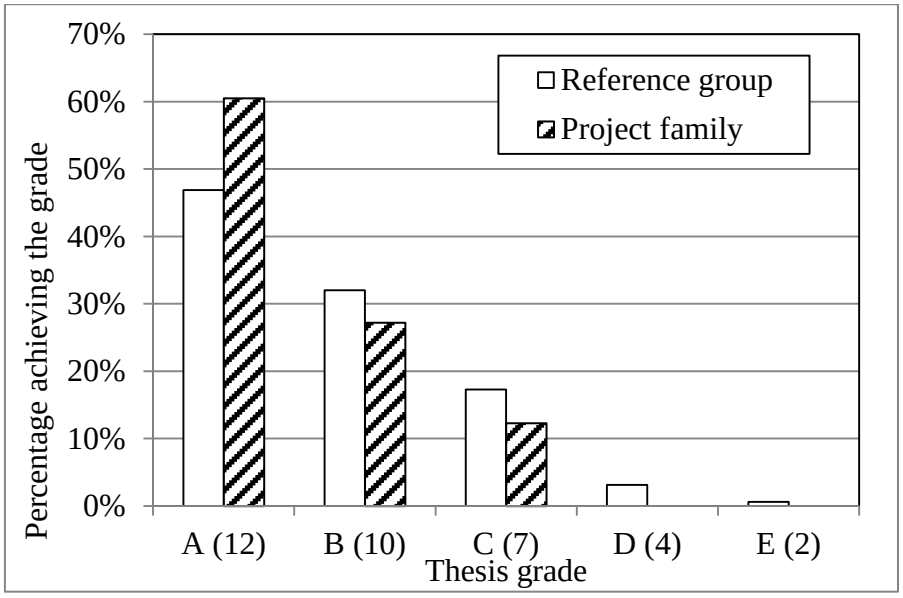

Figure 1 – Grades in student thesis at DTU Byg according to the international ECTS Scale [3] and Danish grade in brackets, (A(12): For an excellent performance; B(10): For a very good performance; C(7): For a good performance; D(4): For a fair performance; E(2): For an adequate performance; Fx and F: Failed).

The students appreciate the project family concept, as the period where the students do their thesis work can be a very stressful and lonely period for students, especially if they work individually. This problem seems to be eliminated with the project family concept, as they will always have a number of peers to discuss with. The concept has also established some amount of peer pressure, which is good for the somewhat relaxed students, but which have also improved their behaviour in the laboratories significantly. The supervisors have experimented with the size of the project family and have found that the optimal size will normally be 7 to 10 students, for the concept to work optimally.

Figure 2 – Students in a project family at their midterm presentation.

The supervisors and the laboratory staff have also noticed that they spend less time on boring, repetitive activities, but also that the project families requires a better planning prior to the projects initiation. If the planning is done properly, the discussions between students and supervisors reach a higher scientific level, than possible with stand-alone projects. The students' behaviour in the laboratories and the quality of their thesis, their presentations and their ability to answer at the examinations has all improved.

4. CONCLUSION AND FUTURE WORK

The concept of project families have been a good and strong success for the thesis works with experimental activities, as it has improved the student performance, the students experience and responsibility during the project, while at the same time reducing the resources needed for supervising and supporting the projects.

The use of project families without experimental work will be tested in the near future and some initial activities have already been initiated.

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